

WHAT IS CLAIMED IS:

1. A minimally-invasive heart valve for implantation at a host heart valve annulus, comprising:

a collapsible and expandable heart valve stent adapted to be delivered in a collapsed state to the heart valve annulus and expanded in position at the annulus, the stent defining a plurality of upstanding commissures and a plurality of arcuate cusps, each cusp extending between adjacent commissures; and

a plurality of prosthetic leaflets attached to the stent, each leaflet having an approximately semi-circular cusp edge terminating at each end in commissure portions and a coapting edge extending between the commissure portions, each leaflet being attached substantially entirely along its cusp edge to one of the stent cusps and each leaflet being attached at its commissure portions to adjacent stent commissures with the coapting edge remaining unattached.

2. The heart valve of claim 1, wherein the stent comprises a generally annular elastic wireform oriented around a flow axis with the upstanding commissures projecting generally in an outflow direction.

3. The heart valve of claim 2, further including:

an annular tissue-engaging base separate from the wireform and expandable from a collapsed state to an expanded state, wherein the wireform and leaflets are connected to the base.

4. The heart valve of claim 3, wherein the tissue-engaging base is plastically-expandable from the collapsed state to the expanded state.

5. The heart valve of claim 3, wherein the wireform attaches to the base at discrete locations so as to couple each of the commissures and cusps of the elastic wireform to the base.

6. The heart valve of claim 1, wherein the prosthetic leaflets each have a cusp edge

attached along a wireform cusp and a pair of commissure portions terminating in outwardly extending tabs that each attach to a wireform commissure, wherein tabs from adjacent leaflets are attached together at each of the wireform commissures.

5 7. The heart valve of claim 6, wherein the tabs from adjacent leaflets extend outward between spaced wires of the wireform commissures, and wherein inserts are provided around which the adjacent leaflet tabs wrap and are secured, the inserts being size larger than the distance that the wires of the wireform commissures are spaced apart so as to maintain the leaflet tabs on the outside of the wireform commissures.

10 8. The heart valve of claim 1, wherein the prosthetic leaflets are formed and attached to the stent separately from each other.

15 9. The heart valve of claim 1, wherein the stent has a fabric covering and the leaflets attach to the stent by being stitched along the fabric covering.

10. An expandable prosthetic heart valve for placement in a host heart valve annulus, comprising:

20 a collapsible and expandable stent system adapted to be delivered in a collapsed state to an implantation site and expanded, the stent system including an expandable generally annular tissue-engaging base and an elastic generally annular wireform attached to the base, the wireform defining a plurality of upstanding commissures and a plurality of arcuate cusps, each cusp extending between adjacent commissures; and

25 a plurality of prosthetic leaflets attached to the wireform in a manner that provides continuous support for each leaflet along the wireform cusps.

11. The heart valve of claim 10, wherein the tissue-engaging base is plastically-expandable from a collapsed state to an expanded state.

30 12. The heart valve of claim 10, wherein the wireform attaches to the base at discrete

locations so as to couple each of the commissures and cusps of the elastic wireform to the base.

13. The heart valve of claim 10, wherein the commissure portions of the prosthetic leaflets terminate in outwardly extending tabs that each attach to a wireform commissure,
5 wherein tabs from adjacent leaflets are attached together at each of the wireform commissures.

14. The heart valve of claim 13, wherein the tabs from adjacent leaflets extend outward between spaced wires of the wireform commissures, and wherein inserts are provided around which the adjacent leaflet tabs wrap and are secured, the inserts being size larger than the
10 distance that the wires of the wireform commissures are spaced apart so as to maintain the leaflet tabs on the outside of the wireform commissures.

15. The heart valve of claim 10, wherein the prosthetic leaflets are formed and attached to the wireform separately from each other.

16. The heart valve of claim 10, wherein the generally annular wireform is oriented around a flow axis with the upstanding commissures projecting generally in an outflow direction and defining the outflow end of the heart valve.

17. The heart valve of claim 10, wherein the wireform has a fabric covering and the
20 leaflets attach to the wireform by being stitched along the fabric covering.